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ABSTRACT

Through a literature review and classroom observations, several variables affecting the quality of education were studied, focusing on processes related to student placement in special education and to instruction after placement. The study found that: (1) A dynamic interaction is needed among the referral, assessment, placement, and instruction processes. (2) Time-on-task data should study the amount of the school day that finds students academically engaged; 43% of each typical school hour was found to be available for instruction, of which 77% was on task. (3) A direct correlation exists between time-on-task and the positive nature of teacher-to-pupil interactions. (4) In-class distractors such as talking out, out-of-seat, and general non-compliance can be remarkably decreased by using very simple, low-intensity, remedial strategies. (5) There is little correlation between teacher characteristics and student learning; teaching skills are a more important factor in student learning and are incorporated into teaching methods through five phases of instruction: knowledge of the underlying theory, demonstration, coaching, appropriate practice, and feedback. The paper concludes that teachers today employ technologies and strategies that are 50 to 75 years old and ignore the research database on behavior management and instructional technology that would enable them to proceed scientifically rather than intuitively. (Fourteen figures are included.) (JDD)

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TIME ON TASK AND OTHER VARIABLES AFFECTING THE QUALITY OF EDUCATION

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January 1985

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TIME ON TASK AND OTHER VARIABLES AFFECTING THE QUALITY OF EDUCATION

BY

GLENN I. LATHAM

Time-on-task, and its impact on academic achievement, has become an area of considerable interest in the schools of America (Rosenshine and Berliner, 1978; Stallings, 1980; Peterson and Swing, 1982; Wyne and Stuck, 1982; Goodlad, 1984; Ysseldyke & Algozzine, 1984; Peterson, Swing, Stark, and Waas, 1984). Over the past several years, I have been studying it and other variables as they affect the quality of education, with particular attention being paid to those processes that relate to the placement of students in special education, and to the instructional process once placement has taken place.

Figure 1 represents the parameters of these studies, each of which is addressed here in some detail.

THE REFERRAL, ASSESSMENT, PLACEMENT, AND INSTRUCTION PROCESS

An astounding phenomenon, and one which is generally characteristic in schools across America, is the typical lack of a dynamic interaction between the referral, assessment, placement, and instruction processes. These processes tend to proceed independent, and independently, as though they had little to do with one another in any sense other than direction; that is, in the direction of the special education room.

The character of assessment, for example, is effected little, if any, by the

Figure 1

IMPROVING THE QUALITY OF EDUCATION IN THE CLASSROOM

The following variables were studied:

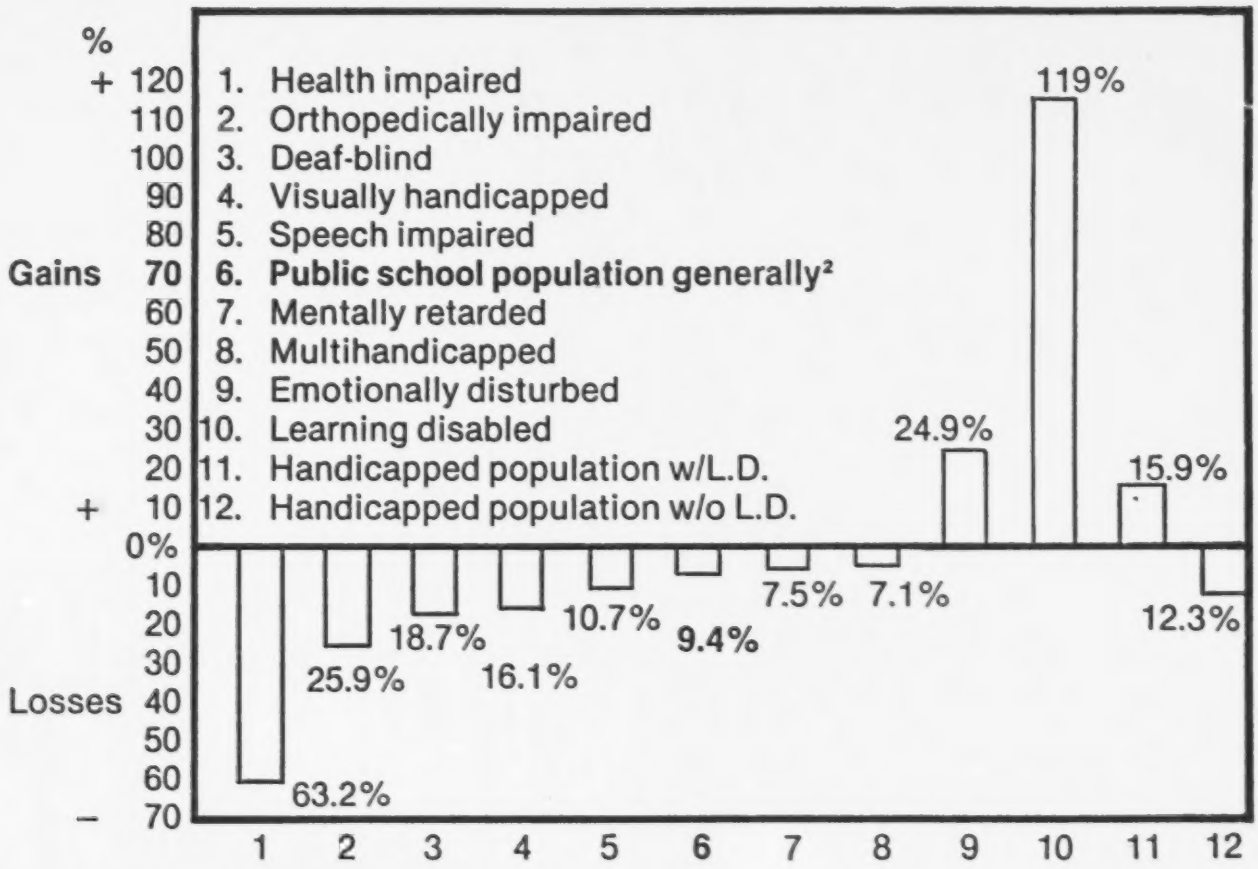
1. Time-on-task
2. Quality of teacher-to-pupil interactions
3. Distractors
4. Quality of teaching skills vs. teacher characteristics, relative to the effective use of cues, effective use of reinforcers and reinforcement, and the interactive involvement of students in the learning task.

referral process. Once referred, all students typically experience the same type of an assessment, the process of which tends to be more characteristic of the training and inclination of the psychometrist than of the particular needs of the students. Of particular concern is the conspicuous absence of classroom based behavioral observations of students as a prerequisite to the administration of the more formal battery of psychometric tests. James Tucker, among others, has demonstrated conclusively that "pre-referral intervention" in the regular class has a remarkable effect on precluding the need for resource room placement. In other words, when the referral processes - that is, referral for assessment, is preceded by classroom based behavioral observations, followed by the development and implementation of an intervention strategy to keep the students in the regular class, the chances are slightly better than one in four that no further action is necessary (James Tucker, Personal communication, Sept, 1984). The students remain in regular education, the teaching and management skills of the regular teachers are improved, and the students and their families are spared the trauma which so often accompanies the label "special ed". It's mainstreaming at its very, very best.

The literature is clear on the matter of the inherent dangers that befall students once they are accepted for referral, especially in the case of males and students of low socio-economic backgrounds (Ysseldyke, Algozzine, and Richey, 1982). The consequence, of course, is that regular education has been relieved of a problem at the expense of a student, and special education becomes a crutch to regular education; hence, the system is what is handicapped - not the student, but the student suffers the consequences of that handicap. The irony is overwhelming. As shown in Figure 2, one has

Figure 2

ENROLLMENT GAINS OR LOSSES IN STUDENT POPULATIONS[1] 1976-1983



1. These figures are extrapolated from data furnished by the U.S. Department of Education Office of special Education Programs.

2. This figure was extrapolated from data furnished by *Statistical Abstract of the U.S., 1984, 104th Edition,* U.S. Dept. of Commerce, Bureau of the Census.

but to look at the population growth in the LD classification since 1976 to begin to appreciate the magnitude of this problem. Since 1976 the number of students classified as LD has increased by 119% while the school population, generally, has decreased 9.4%. Ross (1976) explains the matter this way:

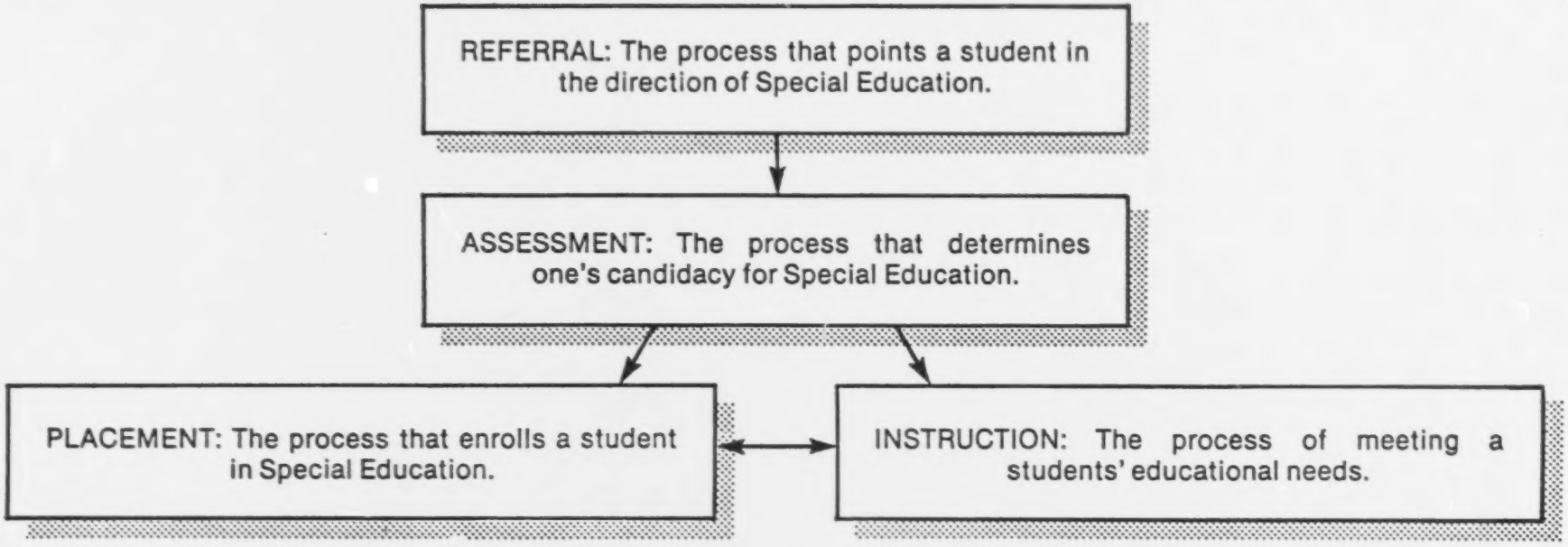
> LD placement is often the easiest alternative for a school, even when there is no clear indication of a handicapping condition. In this way, it is contended, a student's problem is at least temporarily alleviated in that the school has "done something" for the child. Actually, of course, the school may have alleviated its own internal stress without helping the child at all. Placement in a convenient LD class effectively removes much of the responsibility of general education for a child's problem, and with the lowered expectations that come with special class placement there is often significantly less progress.

When considering the linkage between these critical processes (Figure 3), the one with the greatest cause and effect relationship is the linkage between assessment and placement. In some situations, this linkage has been observed to be 88% certain at the outset; that is, before assessment even begins, the chances are nearly 9 out of 10 that the youngster will be classified LD and placed in a resource room. Ysseldyke, Algozzine, and Epps (1983) referred to the process as "bounty hunting". Scriven (Ysseldyke, Algozzine, and Epps, 1983) called it a "...diagnostic scandal' in which students are labeled handicapped simply to increase the flow of state and federal monies to LEAs, and to relieve regular classroom teachers of having to instruct hard-to-teach students."

Tragically, the instructional process in this chain of events stands alone from the other processes. I can find little to suggest that assessment has even the slightest impact on instruction. In this regard, Keogh (1981), made this observation:

Figure 3

LINKING THE CRITICAL PROCESSES


REFERRAL: The process that points a student in the direction of Special Education.
ASSESSMENT: The process that determines one's candidacy for Special Education.
PLACEMENT: The process that enrolls a student in Special Education.
INSTRUCTION: The process of meeting a students' educational needs.

> "...psychologists who presume to work in the schools must know something about the process of instruction, about children to be instructed, and about the complex interactive network that constitutes 'school'."

My point is simply this, the school psychology program is too important and too expensive to be relegated to simply giving tests for the purposes of identification, classification, and placement of students. If this is all the program is to do, its costs can be cut dramatically, with the cost savings going to the instructional programs which harvest the fruits of its labors.

TIME-ON-TASK

The literature reports considerable variances in what constitutes time-on-task. A reasonably representative statement appears to be reflected in the work of John Goodlad in his monumental work, A Place Called School (1984). Generally speaking, Dr. Goodland's data show time-on-task fluctuating in the 70% to 77% range. My observations agree with that -- when the data are derived as he and other researchers have typically studied this variable. But herein lies a major flaw, as I see it; one that distorts the real picture, and leads us to believe that things are much better than they really are.

Typically, time-on-task data are taken as a result of observing a class for a given period of time, computing the amount of time that the students were on task, and reporting that figure as a percentage of the elapsed instruction time. For example, suppose that the length of the instructional

period was 30 minutes, with time-on-task data taken at 30 second intervals, and the students were on task during 45 of those intervals. Under these conditions, time-on-task would be computed to be 75%, which sounds pretty good. Unfortunately, this is a myopic view of what is really the case.

When observing time-on-task, we are really studying the amount of the school day that finds students academically engaged, not simply the amount of such engagement during a selected period of instruction. As I have studied this matter I have been struck by the fact that because of a plethora of distractors that are common to virtually every school in America, over half the school hour is gone before instruction even begins. Figure 4 enumerates those distractors as I have observed them. As a consequence, as is illustrated in Figure 5, 57% of the hour, over the school year, is gone to non-instructional activities. When computing time-on-task, or better put, extent of academic engagement, we typically fail to figure into the equation absenteeism, tardiness, and other blocks of time lost to out of class distractors. We seldom think of attendance at assemblies as being a distractor to academic engagement. We seldom consider the distracting effects of such routine things as taking roll, collecting lunch money, being interrupted by announcements over school PA system, and so on as being significant threats to academic engagement. And yet, when these distractors are observed carefully, and their cumulative effects on instruction computed, we are brought to the startling awareness that nearly three-fifths of the school day is gone to non-instructional distractors. Of course, I recognize, that there will always be some distractors. It is simply not reasonable to hope for 100% academic engagement. There will be distractors of one form or another. But certainly it is not unreasonable that there

Figure 4

When Doing Time on Task Analyses, The Following Variables Need To Be Considered

1. Time lost to out of class activities/distractors
   - Absenteeism
   - Tardies
   - Assemblies
   - Athletic events
   - Other team and group activities
     - -Debate
     - -Band
     - -Cheerleading
     - -Etc.

2. Time lost to out of class interruptions:
   - P.A. announcements
   - Visitors to the class

3. Time lost in class to:
   - Routine activities
     - -Taking roll
     - -Collecting milk/lunch money
     - -Getting seated/grouped
     - -Getting prepared with paper, pencil, book
   - Distractors
     - -Out of seat
     - -Talking out
     - -Non-compliance

4. Time lost to poor instruction which lacks:
   - focus
   - dosage (too few opportunities to respond)
   - skill mastery orientation
   - attention to the principles of behavior that impact on learning

Figure 5

HOW A TYPICAL SCHOOL HOUR IS SPENT

12% lost to non-attendance 7.2 mins	12% lost to out-of-class distractions. -assemblies -athletics -clubs -etc. 7.2 mins	14% lost to in-class distractors 8.4 mins.	19% lost to routine in-class activities 11.4 mins	10% is lost to non-attention during instruction 6 mins	33% of time is on task. 19.8 minutes

57% of the hour (34 min. & 12 secs.) is gone before instruction begins.

43% (25 min. & 48 secs.) remains for instruction of which 77% (19 min. & 48 secs.) is on task.

should be fewer distractors to instruction than there are facilitators of instruction.

QUALITY OF TEACHER-TO-PUPIL INTERACTIONS

My observations reveal a direct correlation between time-on-task and the quality of teacher-to-pupil interactions. When teacher-to-pupil interactions are negative, that is, when the teacher is attending to off-task, "junk" behaviors, on-task behavior is low and off-task behavior is high. This makes sense in light of what we know about the principles that govern human behavior, one of which states that "Behavior follows those things that attend to it." Consequently, if teachers attend to off-task, "junk" behavior then off-task, "junk" behavior is high and on-task academic engagement behavior is low. Conversely, in those situations where teacher-to-pupil interactions are positive, on-task behavior is typically high.

In studying this variable, I am alarmed at what I have observed. The quality of teacher-to-pupil interactions is typically overwhelmingly negative. In fact, negative interactions tend to be at least two times as frequent as are positive interactions, though the range from classroom to classroom is immense. Generally speaking, teachers are simply more attuned to attending to non-compliant, inappropriate, off-task behavior than they are to attend to appropriate, compliant, on-task behavior. In other words, they tend to leave well enough alone and focus, rather, on nipping trouble in the bud. Unfortunately, this tends to accomplish exactly the opposite of what is hoped for; mainly, as I will discuss later, because most classroom teachers simply do not understand the principles that govern human behavior,

or are unable to apply them to their teaching.

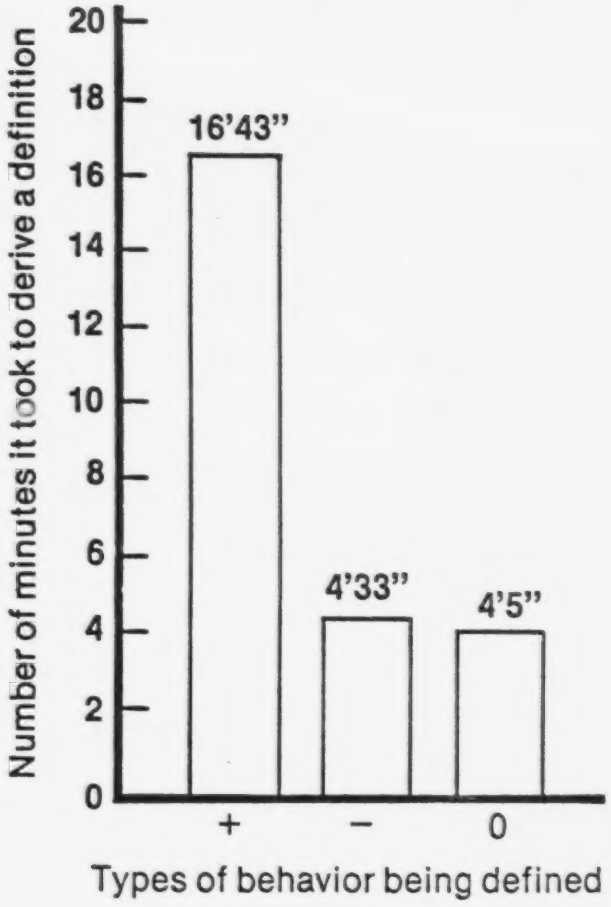
Recently, I observed a teacher training session during which a group of seasoned, certified elementary through senior high school teachers were being instructed in differentiating between positive and negative behaviors, the intent being to improve their ability to interact with students. As a part of the training, these teachers, as a group, were asked to define positive, negative, and neutral behaviors. I was amazed at what I observed. As illustrated in Figure 6, it took the teachers over 16 1/2 minutes, and 27 prompts from the facilitator, to define positive student behaviors; and even then, the facilitator finally had to take the leadership and properly word a definition. I don't know how long it would have taken had those teachers been left on their own. On the other hand, it took but 4 1/2 minutes, and 5 prompts from the facilitator, to define negative student behaviors. It took 4 minutes and 6 facilitator prompts to define neutral behavior. It is a well documented, and a sad matter of fact, that classroom teachers tend to be negative in their interactions with students, the result being that the very behaviors they want to get rid of are the very behaviors that they promote.

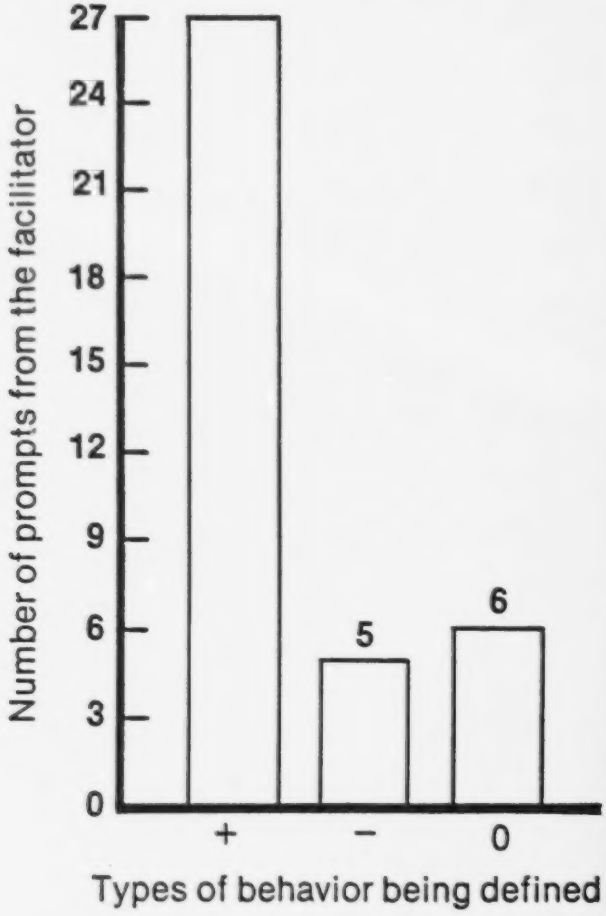
I recently provided two days of intensive training to the teaching staff of a summer program for high risk elementary aged students. I instructed the group in how to increase the number of positive teacher-to-pupil interactions, and how to reduce negative interactions. As a part of that instruction, I gave the teachers a simple guideline which said "Provide at least twenty positive interactions per hour and reduce negative interactions to no more than four or five per hour." The teachers took issue at this,

Figure 6

DEFINING BEHAVIOR

A group of six certified, seasoned elementary and secondary teachers were working under the direction of a facilitator to construct definitions of positive, negative and neutral behaviors.





and assured me that "If we are going to give twenty positive teacher-to-pupil interactions per hour, that's all we'll be doing!" We did some role playing to cue them to ways of being more positive until they became more comfortable saying positive rather than negative things. During subsequent observations in the classroom, I took data on the quality of teachers' interactions with the students and afterwards asked the teachers if they would estimate for me the number of positive and negative interactions that they had had, per hour, with their students. It was generally agreed among them that they were averaging 25-30 positive interactions and 3-5 negative interactions per hour. They nearly fell off their chairs when I told them that they were averaging 167 positive interactions per hour and fewer than two negative interactions. (One aide averaged over 275 positive interactions per hour!) On top of this was the enviable on-task rate of 98% during instructional time. To accomplish this took two remarkably simple strategies:

> First, was a well-defined set of cue-to-task strategies including a set of classroom rules and a schedule of activities.
>
> Second, a simple set of cues used by the teachers to attend to appropriate student behaviors.

As one teacher noted, "Never before have I had the opportunity to be involved with such an all-round positive learning environment."

If we attend to distractors, distractors increase, and vice versa. Now a word about in-class distractors.

IN-CLASS DISTRACTORS

The most common in-class distractors are talking out, out-of-seat, and general non-compliance. These distractors occur at a rate of about one per minute, though the range from class to class tends to be quite remarkable. These behaviors maintain, as one would suspect, because these are the behaviors that provoke teachers responses: "Johnny, why are you out of your seat? How many times as I going to have to tell you to remain in your seat?" "Mary, I can hear you clear over here! Now will you please be quiet?" "Freddy, I told you to put that storybook away and get busy with your math! Now how many times am I going to have to tell you to do that?" In such examples, and they tend to be ubiquitous and systemic, the teacher becomes the biggest distractor of all because in the process of attending to the off-task behavior of a child, teachers unwittingly take the remainder of the class off-task with them. Children look up from their books at Johnny, Mary, and Freddy. They start to giggle. A plethora of other off-task, non-compliant interactions are aroused and the teacher is then faced with not only one student off-task, but an entire class that is off-task. Using very simple, low intensity, remedial strategies, it is possible to reduce these kinds of distractors by 80% within two days, and to within 95% in a week. There will always be some distractors. But the magnitude of them can be remarkably decreased when scientifically sound behavioral technologies are employed, which brings me to the last of the five variable: Teaching Skills vs. Teacher Characteristics.

TEACHING SKILLS VS. TEACHER CHARACTERISTICS

Benjamin Bloom (1980) drew a clear distinction between teacher characteristics and teaching skills, noting that over the years, good teaching has tended to be seen as a function of teacher characteristics rather than teaching skills. In that regard, Dr. Bloom made this observation:

> Over the past four decades there has been a great deal of research on teacher characteristics and their relations with student learning. This research has been concerned with such variables as the age of the teachers, their training, teaching experience, membership in teacher organizations, personality and attitudes, and even performance on achievement tests related to their field of teaching. In general, the relationship between teacher characteristics and student learning has typically been represented by correlations of less than +.20, ... Based on the research done to date, we may conclude that the characteristics of teachers have little to do with the learning of their students.

In this regard, Rinne (1982) made this observation:

> New teachers who search for effective methods of classroom control meet a haphazard assortment of published and unpublished testimonials and philosophical recipes. Faced with the lack of principles, most teachers do the logical thing: they accept the conventional wisdom and do the best they can. In doing so, they suffer considerable hardship, frustration, and anxiety. How can educators create conditions for truly professional practice in classroom control? We can begin by recognizing the difference between attention to task and attention to teacher.

Dr. Bloom reminds us that good teaching is really found in the ability of teachers to effectively use cues, reinforcers, and to appropriately engage students in the learning task. He and other educational researchers have identified principles of learning, instruction, and human behavior which, if applied properly, will produce an environment in which the probability for

learning increases remarkably. Unfortunately, evidences of those technologies and principles operating within the classrooms of our public schools are alarmingly few. Over the years, as I have sat in classrooms across this country observing the strategies that teachers use to manage behavior and provide instructions, I have observed very little of what could be referred to as scientifically sound. Rather than creating, by design, an environment that is structured for learning, I have generally observed teachers simply assigning to students things to be learned. Learning and behavior problems tend not to be dealt with in systematic, scientifically sound ways. Teachers tend to respond intuitively rather than scientifically and professionally; or, as Rinne put it, "...they accept conventional wisdom and do the best they can." Based on the hundreds of interviews I've had with teachers across the country, the reason they give for responding as they do is that they have never been taught any other way. According to these many, many teachers, our colleges of education nationwide simply do not teach teachers to behave professionally and scientifically in the classroom. It is my observation, and I say it with considerable anguish, that the greatest deterrent in America today to quality teaching is the teacher training establishment in our colleges of education.

To explore the thesis that teachers proceed intuitively rather than scientifically, I approached a randomly selected group of individuals representing engineers, physicians, lawyers, and educators. I asked each of these people to describe to me a problem which they typically encounter in the course of their work, and to then tell me how they set about solving that problem. Figure 7 summarizes their responses.

Figure 7

APPROACHES TO PROBLEM SOLVING

OTHER PROFESSIONS	BY EDUCATORS
Engineers Refer to laws, principles, formulas related to force, stress, motion, pressure, etc.	"It seemed at the moment to be a good way to handle the situation." "I've used it before and it's worked well."
Physicians Refer to their knowledge of physiology, anatomy, microbiology, chemistry, the central nervous system, the flow and circulation of body fluids, etc.	"It was suggested to me by a fellow teacher / a supervisor / a professor / the principal." "That's the way the teacher's manual said to do it."
Lawyers Refer to constitutional law, statutes, precedent, logic, courtroom procedures and knowledge of the judicial system, etc.	"I was taught to do it that way at the University." "I don't really know. I never thought much about it." "I just fly by the seat of my pants."

I agonized over what I observed. Simply stated, members of other professions, at least these other professions, tend to proceed on the basis of principle, law, and science; in other words, they proceed professionally. Educators on the other hand tend to proceed intuitively, idiosyncratically, and with "conventional wisdom." To further explore this matter, I conducted a pilot study in which I selected small groups of individuals representing these same professions, and asked them to tell me what they typically read. I designed this study so that the respondents would not be cued to the fact that I was exploring the area of professional growth activities. The findings were clear. Although, as shown in Figure 8, educators also read widely, they tend to read more from the popular press, and when they do read the professional literature, it tends to not be in their subject areas. Public school administrators tend to focus their professional reading in the areas of school law.

Members of other professions are more inclined to read from the literature of their professions, with particular focus on their specialty area. The results of the pilot study, though too soft to justify broad statements of generality, do raise a viable point. My theory is that educators rely less heavily on the professional literature for support in their work than do members of other professions, generally. To further explore areas of interest to special educators, I analyzed the subjects and frequency of SpecialNet messages for a 2 1/2 month period of time and found, as shown in Figure 9, a preponderance of law related messages, and only one related to instructional intervention.

These findings led me to the library where I reviewed the literature of

Figure 8

READING HABITS: A COMPARISON BY PROFESSIONS

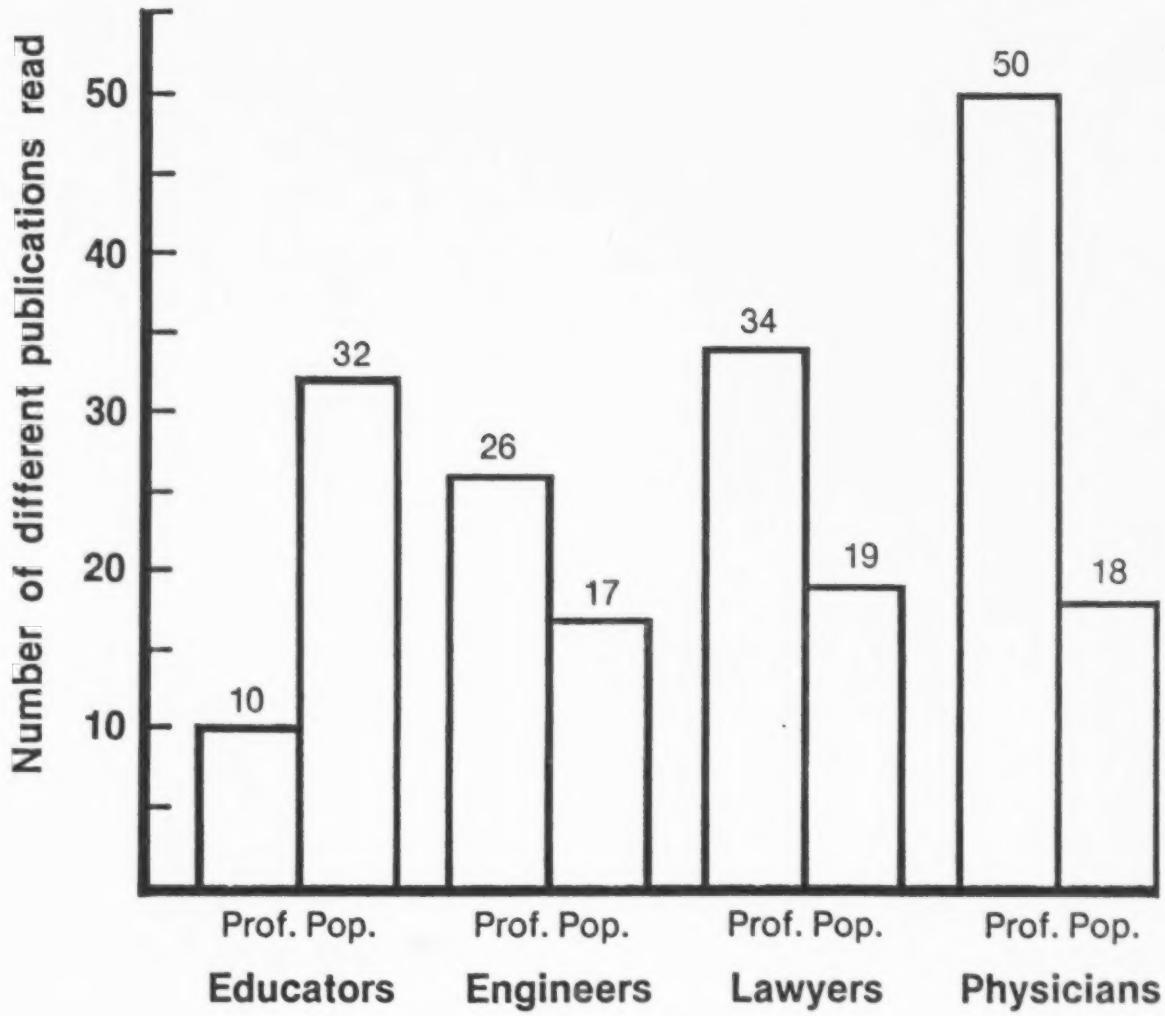
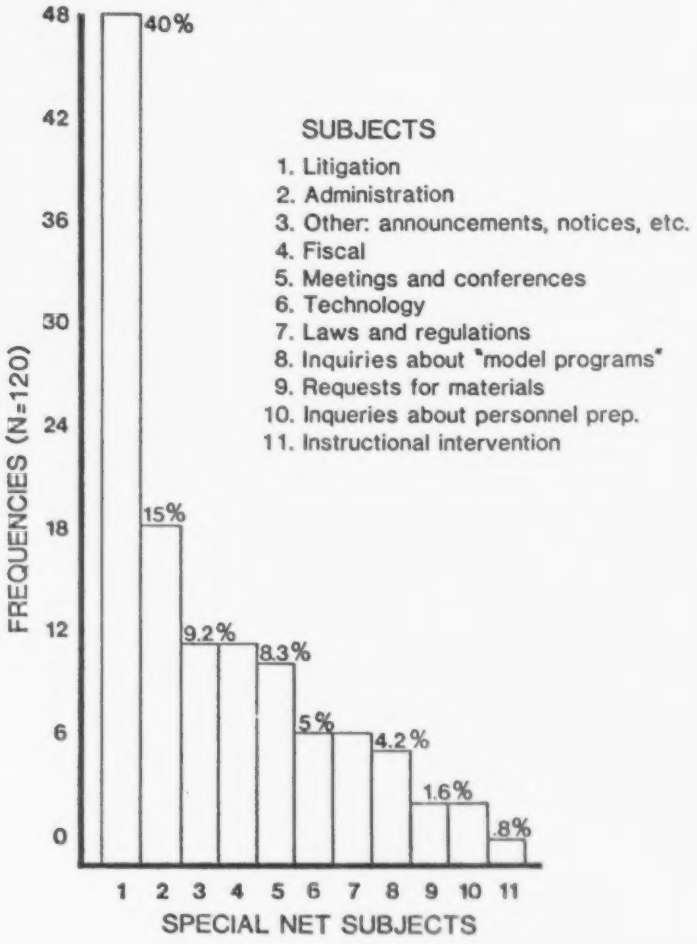


Figure 9

SPECIAL NET MESSAGES: SUBJECTS AND FREQUENCIES

JUNE 4, 1984 – AUGUST 21, 1984



education to find out what educators get as a result of reading the literature, or miss as a result of not reading it. Here is what I found. The literature seems to address educational problems and circumstances as they relate to three categories of students, whom I have identified as follows (see Figure 10):

Those Who Can't, i.e. the "handicapped."
Those Who Can and Will, i.e., the "mainstream" of the school population.
Those Who Can But Won't, i.e. students with ability who are "turned off" by education.

An analyses of the literature related to these three categories says, at least to me, the following:

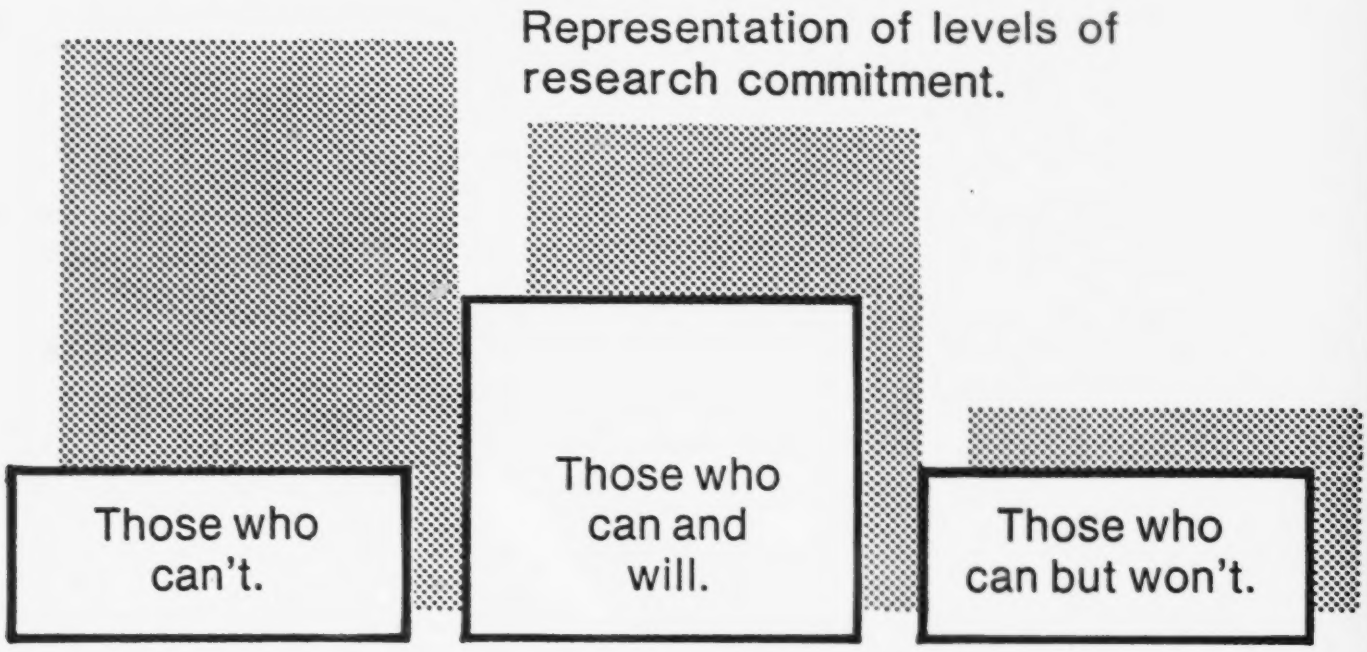
For the "those who can't" category, research in learning and the technology of teaching has dominated the attention of researchers in education and psychology. Hence, the vast majority of scientifically sound, data based research in education and learning has come from attention to this category, where the emphasis is in the design and effects of intervention strategies on learning and behavior.

For the "those who can and will" category, the attention of educators has focused primarily on issues such as merit pay, career ladders, length of the school day/year, discipline, "back-to-basics", declines in national norms, public opinion, teacher benefits/rights, teacher shortages, laws and legislation, financing education, and class size. Hence, the vast majority of publications in this area has been dominated by committee reports; statements of philosophy about American education; treatises on education

Figure 10

IMPACTING ON ACADEMIC ACHIEVEMENT IN EDUCATION

In the public schools, relative to grade level academic performance, students fall generally into three categories, as follow:



from an historical/international perspective; position and concept papers on how to improve education, what's right about/wrong with the American education system, and how education should address persisting social issues such as education in inner city schools, educating minorities, and the role of schools in dealing with violence; and descriptive studies which report the relative standing of students today with students of prior generations.

For the "those who can but won't" category, only a passing, almost patronizing, interest is most characteristic. The general education literature is lightly sprinkled with articles of needs, apologies, advice and encouragement, all of which comes pretty much to naught in terms of improving academic conditions for the able and more able but less academically inclined students. Hence, neglect - but <u>not</u> benign neglect.

Educational decision making, as it relates to these categories, looks very much as is shown in Figure 11. Data tends to play an alarmingly weak role in decision making, with only an <u>inclination</u> toward data based decision making being characteristic of the "those who can't" category. "The other two categories are wastelands of data based decision making - if decisions are made at all. Not that the data aren't there, they just aren't used.

Without data to guide instruction, "conventional wisdom" prevails, with the effects of instruction on student achievement looking generally as illustrated in Figure 12, where the assignment of things to be learned dominates the instructional process, and learning is primarily a function of student aptitude and inclination.

Figure 11

EDUCATIONAL DECISION MAKING BY CATEGORIES OF STUDENTS

Category	Decision Making Processes
"Those who can't"	Decisions are more inclined to be data based.
"Those who can and will"	Decisions are more inclined to be non-data based; influenced rather by bias, political/public pressure, inertia, tradition, and intuition.
"Those who can but won't"	Decisions are not being made; or the decision has been made not to decide.

Figure 12

INSTRUCTIONAL EFFECTS ON LEARNING BY CATEGORIES OF STUDENTS

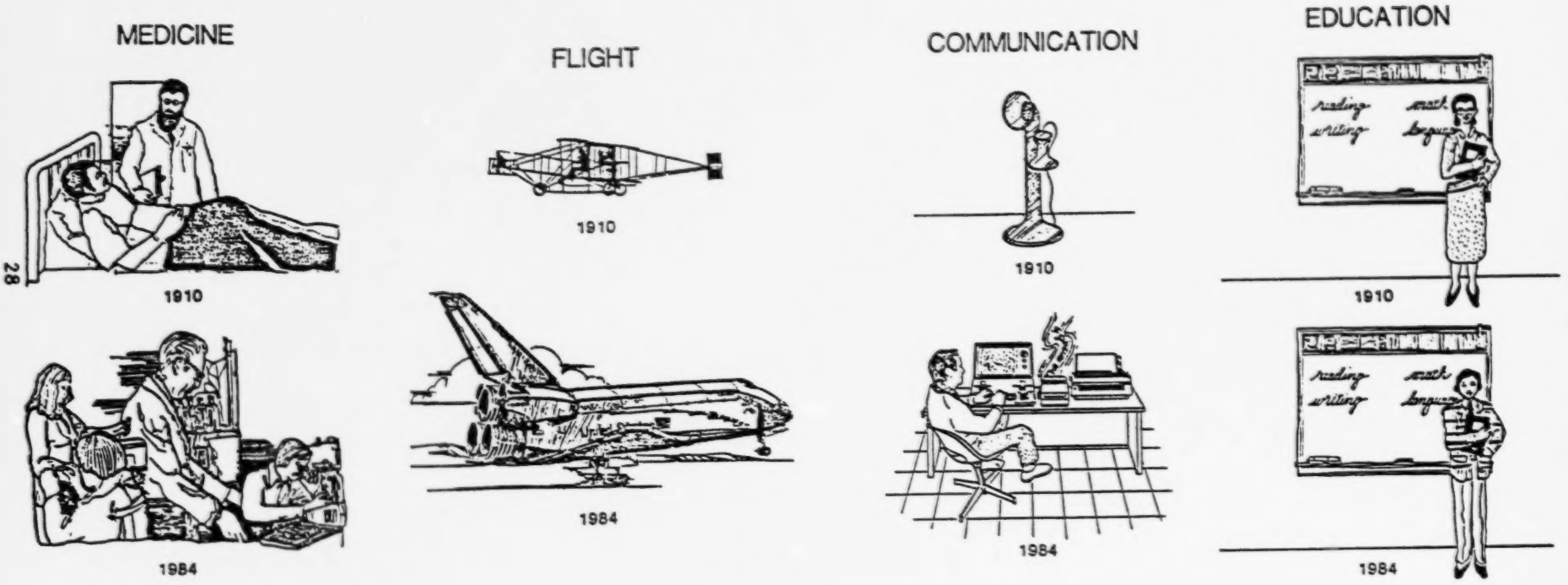
Category	
"Those who can't"	They learn **because** of instruction. Incidental learning is minimal.
"Those who can and will"	They learn **because** of instruction and **despite** instruction. Incidental learning is maximized.
"Those who can but won't"	They spurn instruction and learn by their own wits. Incidental learning is maximal.

While doing this overview, I came across an article that was published in one of the leading educational journals in America which boldly declared that teaching is not a science; rather, it is an art. I was shocked to think that in this day and age, a major professional journal in education would even publish such an article. It is tantamount to a professional journal in medicine publishing an article on blood letting as a viable, modern-day medical procedure.

So long as this mentality and this level of thinking prevails, education will gradually slip further and further out of sync with its own database.

As I review the literature and observe in classrooms, I am impressed (or depressed) to conclude that, relative to the management of behavior and the technology of instruction, public school education today is 50 to 75 years out of sync with science. What that means, very simply, is that we are employing today technologies and strategies that are 50 - 75 years old and are ignoring the database. It is amazing to me that society will tolerate such a discrepancy. It is unimaginable to think of medicine, for example, being 75 years behind its own technology. It is absurd to imagine that transportation would employ today as the state of the art, technology that is 75 years old. Or that communications would be so antiquated as to be reflective today of what it was 75 years ago. But that is what we observe to be the case in education (see Figure 13). It is a "refusal to be scientific" (Skinner, 1983). We know how to create in any classroom in America and in any school in America a scientifically sound environment that facilitates maximal academic gains in students. But these technologies and strategies are not being taught to teachers. B.F. Skinner (1983) put it

Figure 13


MEDICINE
1910
1984
FLIGHT
1910
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COMMUNICATION
1910
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EDUCATION
reading
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1984

this way:

> "We know that there are effective methods of teaching, but these methods are not being taught in schools of education. Strong forces in the philosophy of education are opposing effective teaching...I call it a refusal to be scientific."

Here is an example of what I mean when I say that teachers generally do not understand the science of instruction. Recently, I was invited to observe a class that was regarded as being exemplary. The class was a visually pleasant place to be in, the teacher was well organized, there was an adequate supply of teaching materials, and the students were well behaved. As I had been told would be the case, the students were on-task. In fact, as shown in Figure 14, the children had a nearly 80% level of on-task behavior during the nearly 53 minutes that they were being instructed. But as I observed more carefully, I noticed that an important principle related to learning was being violated. The principle is this: learning is in part a function of the nature of the stimuli which are intended to evoke the desired behavioral change. In that regard, we know that when learning a new skill, it is essential that the "dosage" of stimuli be fairly intense. There are some data, for example, that show that to attain functional skill mastery, a stimulus should be presented every second and the student should be able to respond correctly to each stimulus within one second, and to do so with 100% accuracy. Having that in mind, I counted the frequency with which stimuli were presented to these five children, measured the amount of time that was allowed for an appropriate response, and noted the nature of the response. As illustrated in Figure 14, in the 52 minutes and 37 seconds that the children were in the instructional situation, they were presented with a total of only 13 stimuli. Furthermore, they had an average of 14

Figure 14

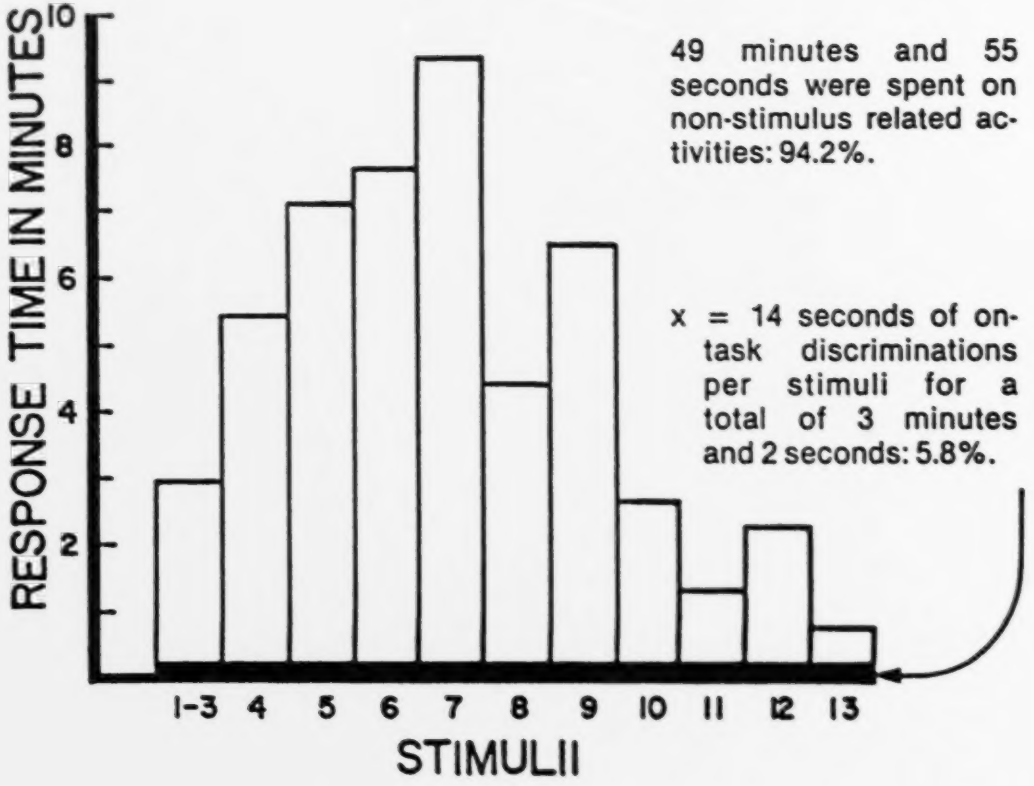
TIME LOST TO POOR INSTRUCTION: AN EXAMPLE

INSTRUCTIONAL TASK: The children were given 13 stimuli. For example (in highly animated and theatrical tones), "Billy is pulling the wagon up the hill. Find Billy pulling the wagon up the hill and draw a circle around him with your crayon."

RESPONSES OF THE CHILDREN: The children made the appropriate discriminations, and were then told by the teacher to "Color the picture."

EXTENT OF TIME ON (ASSIGNED) TASK: Time-on-task for each child was as follows: 62%, 70%, 74%, 88% and 100%, with a mean on-task rate of 78.8%.

EXTENT OF ACADEMICALLY ENGAGED TIME: Of the 52 minutes and 37 seconds of assigned time, 3 minutes and 2 seconds were spent engaged in the academic task, or 5.8%.



49 minutes and 55 seconds were spent on non-stimulus related activities: 94.2%.

x = 14 seconds of on-task discriminations per stimuli for a total of 3 minutes and 2 seconds: 5.8%.

seconds to make a response to each stimulus. And then, to further confound the matter, they were invited to engage in a totally unrelated activity which dramatically diluted the already minimal dosage of instruction that they were receiving: they were told to color the picture that they had circled. As a consequence, although the children were on task 78.8% during that period of time, they were actually responding to the critical stimuli for a total of only 3 minutes and 2 seconds. This was calculated to show that during the 52 minutes and 37 seconds of instruction, they were academically engaged only 5.8% of the time. When I brought this to the attention of the teacher, she was dumfounded. Although she had graduated from a respected state college of education, she was totally unaware of the relationship between the nature of stimuli and learning.

Research reported by the University of Oregon (DeBovoise, 1983) has shown that for teachers to learn a new skill and to incorporate that new skill into their teaching, they need to proceed through five phases of instruction:

1) A knowledge of the underlying theory. It is ironic that although it is essential that teachers have a knowledge of the theory that underlies the teaching act, it is the study of theory that is generally the most distasteful in teacher training programs. The cry is to "get on with practical things and skip the theory." This is unfortunate. Without being well founded in theory, the prospective teacher is at best a technician, able only to deal with those situations that were discussed and illustrated in class, and unable to generalize beyond them to the limitless variety of situations that arise in the course of a day's instruction. It is indeed curious that that which is first and foremost in "practical" importance is the one thing that is typically attended to the least.

2. Demonstration. It is essential that the skills being taught be demonstrated in real life situations where the problem solving process is facilitated, and that these demonstration settings be supervised by one who is knowledgeable and expert in the technology involved. Here again, we observe a great discrepancy. It is a rare circumstance indeed when the so-called master teacher or supervising teacher understands and practices an instructional technology well enough to be able to demonstrate it. Rather, what we typically observe is not a demonstration in science but a demonstration in intuition. This tends to create a sad and frustrating situation, since it is almost impossible to communicate intuition from one person to another; consequently, the learner leaves the demonstration situation confused, uncertain, and without the necessary skills or knowledge base.

3. Coaching. As we observe student teaching or inservice training settings, we observe very little of what can be called coaching. Rather, we observe critiquing, critiquing which reflects the intuitive stance of the critiquer; hence, we are in the same bind as that described above.

4. Appropriate practice. In the absence of conditions 1, 2, and 3 above, it is not possible for appropriate practice to take place; consequently, in teacher training settings, the trainee is as inclined to practice inappropriate strategies as he or she is to practice appropriate strategies. And remember, practice does not make perfect. Practice makes permanent, which is one way of explaining why it is so incredibly difficult to change teacher behavior once the teacher has assumed responsibility for the class. The data related to inservice training is simply shocking. Studies with which I am familiar indicate that inservice training activities are only 2-5% effective; effective in the sense that those who receive training actually implement that training in the classroom. This circumstance is even more alarming when one considers the quality of what is being taught during inservice.

5) Feedback. Teachers almost never receive databased, objective, well-articulated, systematic feedback about their performance in the classroom. When they do receive feedback, it is generally in the form of drawing some

sort of a relationship between what the classroom teacher does intuitively and what the observer would do intuitively. Feedback is almost never related to, or reflective of, the science and technology of teaching; that is, reflective of conditions that we know must exist to assure maximal learning. Here is an example of what I mean. I recently accompanied an instructional supervisor of a fairly large school system on a classroom visit. He wanted me to observe with him an elementary class of 5th and 6th grade students. He was a bit concerned about the competencies of the teacher. We took our places toward the back of the class and spent the next 45 minutes observing. I busily recorded large quantities of data on a broad array of teacher and student behaviors. By the time the observation period was over, I had two full pages of frequency, duration, and descriptive data. As we left the class, the instructional supervisor's comment to me was, "I have been talking with that teacher for weeks about what he should do to improve the appearance of that bulletin board." We had observed together a classroom in which a multitude of important behaviors were occurring, many of which were seriously in need of technical attention. All of those behaviors completely escaped the instructional supervisor. The focus of his attention was on the appearance of the bulletin board. That night, I analyzed and organized the data from that observation, arrayed it graphically, and where discrepancies existed I suggested remedial strategies. The next day I presented my analysis to the teacher. His comment to me was, "I have learned more about teaching, and about my teaching, in the last hour than I ever learned in four years of college and two years of teaching." And dozens of teachers have made that same type of observation to me after being presented with data reflective of their teaching. With such data, I have observed that the quality of teacher-to-pupil interactions shows an 80% shift from negative to positive. On-task behavior increases 60-80%, distractors decrease 70-90%. I am convinced that we must establish and work from a data base. We in education are characterized by an inclination toward data free decision making, toward the planting of our feet squarely in mid-air.

The roles of teacher supervisors, master teachers, and instructional supervisors, as presently operationalized, are generally ineffective. They are generally ineffective because the individuals involved do not operate

from a common, scientifically sound, database and set of principles. Rather, it is one person's intuition, experience, idiosyncracies, or "conventional wisdom" that is being used as the standard. Hardly a standard for excellence.

Just a word about intuition. Intuition is defined as "the power or faculty of attaining to direct knowledge without evident rational thought and influence" (Webster's New Collegiate Dictionary, 1980). By observation, one quickly learns that there is considerable variance in the quality of intuition from one person to another. At the one extreme end of that continuum is behavior which is more characteristic of sheer guessing and out-and-out desperation for something that will work. At the other end of that continuum is the display of brilliance. Einstein put it this way:

> The mind can proceed only so far upon what is knows and can prove. There comes a point where the mind takes a higher plane of knowledge, but can never prove how it got there. All great discoveries have involved such a leap... (Einstein: The Life and Times).

This much, at least, is evident relative to intuition:

1. The more knowledgeable one has, the higher the quality of intuition;
2. The intuitive performance of one should not be the standard of performance for another.

Intuition is a great advantage enjoyed by the knowledgeable. To the naive, it is a poor substitute for knowledge. As noted by Mr. Lee Iacocca (1984), "I may act on my intuition - but only if my hunches are supported by the facts."

CONCLUSION

If we were to proceed vigorously and with determination, it is possible that

within the next 20 to 25 years we could revise the nature and quality of our educational system, and reduce the gargantuan discrepancies that now exist between what we know can be done and what is being done. It galls me when I watch educational leaders at all levels wringing their hands about what to do about education when answers are right here before us. It mortifies me when we suppose that solutions to today's educational problems rest in solutions to such non-specific matters as "back-to-basics", career ladders, teacher benefits, "good old fashioned discipline", and on and on and on. No, the answers to Education's most demanding problems do not rest in solutions to these problems. The answers to education's problems are found in what Benjamin Bloom (1980) has already articulated:

> If we are convinced that a good education is necessary for all who live in modern society, then we must search for the alterable variables that can make a difference in the learning of children and adults in or out of the school. Such alterable variables will do much to explain the learning process, and they will do even more to directly improve the teaching and learning processes in the schools. Our basic research task is to further understand how such alterable variables can be altered and their consequent effect on students, teachers, and learning...When they are thoroughly understood and well used, they will bring about the most profound changes in the schools and in the society.

If people are dying like flies because the medical profession doesn't know how to treat disease, the solution to the dilemma is not going to be found in building more hospitals, increasing personnel benefits, or improving the community's ambulance service. Although these may be important peripheral issues, the solution to the basic problem would be found only in improving the skill of medical personnel to treat the malady. And so it is with education. We are trying to kill the beast of educational mediocraty in America by casting our slings and arrows at non-vital tissue. Granted, we

may be able to draw some blood, inflict some scars, evoke shrieks and cries of pain, and even deform the beast somewhat. But we will neither kill nor tame it. It will continue to grow, and it will continue to grow more and more menacing.

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